Bulletin 761

Raising Dairy Calves and Heifers

K. L. Turk and J. D. Burke

Cornell Extension Bulland

CONTENTS

	PAGE
Care of cow at calving time	. 4
Care of the newborn calf	. 4
Early management	. 4
Feeding the young calf	. 5
Sanitary precautions.	7 7
Feeding schedules for calves. Limited whole-milk and dry-calf-starter method.	
Whole milk	
Water,	
Grain mixture	
Hay	
Amounts of feed required	12
Growth rates to be expected	. 12
Whole-milk method	
Use of nurse cow	. 13
Use of skimmilk	14
Dried skimmilk	
Use of milk substitutes	
Silage in calf rations	
Pasture for calves	. 15
Mineral needs of calves	. 16
Vitamins for calves	
Vitamin A	
Vitamin D. Other vitamine	
Other vitamins. Housing and management of calves.	
Quarters	
Exercise	21
Marking for identification	21
Dehorning	21
Removing extra teats	
Care of the feet,	22
Teach calves to lead	22
Prevention and control of calf diseases	22
Scours	
Pneumonia	24
Ringworm and mange.	25
Cattle grubs	
Internal parasites	26
Calf vaccination for brucellosis	26
Proper development of dairy heifers	27
Relation of size of cow to production	27
Growth standards for dairy heifers	28
Estimating the weights of dairy heifers	28
When to breed	28
Feeding schedule for dairy heifers	29
Winter feeding	
Silage	
Concentrates	-
Feeding heifers on pasture	
Water	33
Water Minerals Housing plans for dairy heifers	33
Housing plans for dairy heifers	34
Pen stabling	34
Stanchions	34
Exercise yard	34
Preparation for freshening	34
Training to milk. Feeding and raising the young dairy bull.	36
a seeding and raising the young dairy built	20

Raising Dairy Calves and Heifers

K. L. TURK AND J. D. BURKE

ALL improvement in the inherent producing ability of a dairy herd is accomplished through either purchased replacements or through calves that are raised. The most certain way to improve the producing ability of your dairy herd is to breed the cows to sires of known high-transmitting ability, and to grow the calves and heifers for optimum size. You may use the best of these heifers as replacements for the lower producing cows that you cull or sell each year.

The number of calves that you will need each year to maintain herd numbers will depend on herd management and herd health. Dairy Herd Improvement Association results show that the average annual herd replacement rate is about 20 per cent, not including cows sold for dairy purposes. Not all the calves that are born will live, develop, or breed satisfactorily. About one-third as many heifer calves need to be raised each year as there are cows in the herd. When selection is possible, raise only calves from the best cow families. If you select and prove the sires in your herd, you will want to raise and test the first 8 or 10 daughters of each sire to get an accurate sample of the sire's transmitting ability.

Often it pays to raise more than the minimum number of replacements if they are well bred and properly developed. The sale of surplus heifers and cows can be an important source of additional income on your dairy farm. Usually, only good-quality animals bring high enough prices to leave a profit over the cost of raising them.

To raise all the replacements needed on your farm helps to maintain a healthy herd, because there is less danger of introducing infectious diseases, such as brucellosis, shipping fever, and vaginitis, than when you buy replacements.

Milk production per cow is the most important single requirement in determining the total income and net profit from a dairy herd. High-producing cows convert feed into milk more efficiently than do low-producing cows. The average yearly production of all cows in New York State is about 6500 pounds of milk and 245 pounds of butterfat. The cows on test in New York Dairy Herd Improvement Associations average 9000 pounds of milk and 342 pounds of fat. Many of the Dairy Herd Improvement Association members have attained and maintained an average yearly production of 400 pounds of butterfat in their herds. An excellent goal for dairymen and breeders is to have a herd that averages 400 pounds of fat. The amount of milk given by a cow depends on (1) her inheritance and (2) the opportunity given her to express that inheritance through good feeding, care, and management.

Care of Cow at Calving Time

NEARLY two-thirds of the development of the fetus, or unborn calf, is during the last three months of the gestation period. While the fetal requirements for growth are not large, there is a direct relation between the feeding of the dam and the development of the fetus and the vigor and thriftiness of the newborn calf. The nutritive value of the colostrum (the first milk) is influenced by the ration fed prior to calving. The ration of the dam must be adequate in phosphorus, calcium, vitamins A and D, protein, and energy. To supply these requirements, feed high-quality feeds, especially good hay.

It is important to dry off cows two months before they are due to freshen and to condition them properly for freshening and for production during the next lactation. Feed the dry cow all the good-quality mixed or legume hay she will eat and, if available, liberal amounts of silage. Good-quality hay is not only an economical source of total digestible nutrients and of protein, but furnishes vitamins A and D, calcium, and most of the other minerals

needed.

Feed enough low-protein concentrates to build up a reserve of body fat. A mixture of 600 pounds of cereal grains, 300 pounds of wheat bran, and 100 pounds of linseed or soybean oil meal makes a good ration for the dry cow. Usually from ½ to ¾ pound of concentrates is needed daily per 100 pounds of liveweight to get cows in desirable body condition. Provide free access to water and salt.

Additional amounts of wheat bran, beet pulp, molasses, or other laxative feeds may be substituted for all or part of the fitting mixture a few days

before and after freshening.

A few days before the cow is due to freshen, stable her in a roomy, well-bedded box stall. It is a good practice to clean and disinfect thoroughly the maternity stall each time before it is used. A well-drained, clean paddock or small pasture near the barn also makes a good place for cows to freshen during the summer months.

The normal gestation period for cows is 283 days. Signs of approaching freshening include a sinking and loosening of the ligaments around the tail head, filling of the udder and teats with colostrum, and a restless nervous disposition on the part of the cow. Most cows give birth to their calves without difficulty, but it is good practice for you to be on hand to render aid if needed.

Care of the Newborn Calf Early Management

Usually a cow begins to lick the calf immediately after birth. This not only helps to dry the calf, but helps to start respiration and improves

circulation. In cold weather it may be desirable to rub the calf briskly with a dry cloth or burlap feed bag. Also, it is sometimes necessary to start respiration artificially in the newborn calf. Be sure that the fetal or mucus membranes do not cover the nostrils and prevent the calf from breathing.

Disinfect the calf's navel cord with tincture of iodine soon after birth, to prevent infections from entering the body through this channel.

Within a short time after birth, the calf is usually strong enough to stand and nurse. If it is too weak to stand up and nurse in an hour or two, help the calf to insure nursing.

Feeding the Young Calf

The first milk given by a cow after the birth of a calf is colostrum. It provides essential food for the calf and starts the digestive system to function. Colostrum also helps to protect the calf from diseases. It is high in vitamin-A value, although the amount varies. A calf is usually born with no reserve of this vitamin; yet, it must be obtained from some source if proper growth is to be made. If for any reason the calf does not get colostrum, give it a dose of cod liver oil or a vitamin-A supplement.

Because of the importance of colostrum in getting the calf off to a good start, leave the calf with its mother for the first two or three days after birth. Feed any surplus colostrum to other calves rather than throw it away. While the calf is still on the cow, be sure it does not overfeed. If the cow comes into her milk rapidly, put a muzzle on the calf and allow it to nurse at certain intervals.

Figure 1. All newborn calves need colostrum. Allow the calf to nurse the first two or three days.



After the calf has been separated from its mother, teach it to drink milk from a pail or feed it from a nipple pail. It is not too difficult to teach a hungry calf to drink from a pail. A good procedure is to back the calf into a corner and straddle its neck. Dip one or two fingers in the warm milk, then allow the calf to suck the fingers as its head is drawn down gradually into the pail. As the calf's head is drawn down its mouth comes in contact with the milk. As milk is sucked between the fingers they can be withdrawn from the calf's mouth. After one or two such lessons, the calf will usually drink without coaxing.

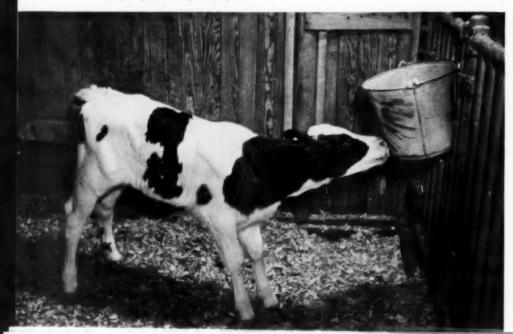
In recent years nipple feeder pails have come into use. They are an attempt to duplicate Nature's method of feeding. These nipple pails do prevent the calf from gulping milk, and it is believed that they may help to reduce digestive disturbances. Care must always be taken to see that the pail and nipple are kept clean, otherwise they might cause more digestive troubles than would the ordinary pail method.

If possible, when pail feeding is started, give the calf its mother's milk for several days. Be sure that the calf is not fed too heavily on milk, especially during the first month. Overfeeding may cause digestive upsets followed by scours. A calf will usually do better if kept a bit on the hungry side.

A good rule to follow in feeding milk is not to exceed 10 per cent of the body weight of the calf in pounds of milk fed each day. This will be from 5 to 8 pounds for the calf each day during the first few days, depending upon the breed and the size of the calf.

A calf commonly is fed milk twice each day. Some dairymen, however,

Figure 2. Nipple pail gives good results. It prevents the calf from gulping milk and may help to prevent digestive upsets.



prefer to feed milk three times a day until the calf has a good start. This procedure may be recommended for calves that are small or weak at birth.

The digestive tract of a young calf is undeveloped, and for the first few weeks it must be fed chiefly on milk and on concentrated feeds high in digestible nutrients and relatively low in fiber. The digestive tract, however, changes rapidly and becomes especially adapted to handle hay and other roughages.

Sanitary Precautions

A successful program for raising strong, healthy calves must include good sanitation. Cleanliness is one of the first essentials. Wash all feeding pails thoroughly and sterilize them after each feeding, just the same as other dairy equipment. Dirty pails and contaminated milk are frequent causes of common calf scours.

Regularity in calf feeding is always important. Weigh the milk at each feeding and make all changes gradually. Best results are obtained when fresh milk is fed at a uniform temperature of from 95° to 100°F.

Keep the calf pens clean, dry, and well-bedded at all times. Proper ventilation, resulting in freedom from drafts and dampness, is essential for healthy calves.

Keep the mangers and feed boxes clean. Regular cleaning of the feed box will prevent the calf from eating moldy or contaminated feed.

Feeding Schedules for Calves

Any successful feeding schedule for dairy calves includes whole milk during the first few weeks. Following this period, the procedure used is generally determined by the method of marketing milk or cream from the farm. On the fluid-milk markets, whole milk is often too expensive to feed, except for the first few weeks. Where this is true, dairymen need a method that produces high-quality calves on a minimum of milk. In other areas of the country where cream is the product sold from the farm, the skimmilk left is an excellent feed for calves.

Success or failure with any of the methods of raising calves depends largely upon the skill and judgment of the feeder and his ability as a dairyman. A great deal of common sense and judgment must be used along with any suggested rules or schedules. Keep in mind, therefore, that the following feeding schedules are intended only as guides. Each calf needs to be fed and managed as an individual.

Limited Whole-Milk and Dry-Calf-Starter Method

Several years of investigations and the experiences of thousands of dairymen show the value and advantages of the dry-calf-starter method for raising calves on a minimum of milk.

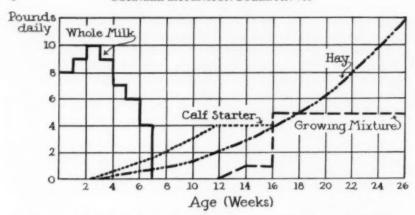


Figure 3. This feeding schedule, for the dry-calf-starter method of feeding Holstein, Brown Swiss, and Ayrshire calves, is to be used only as a guide. Each calf must be fed carefully and according to its individual needs.

This method is economical, and the care and labor required in feeding are reduced to a minimum. After the first few weeks all of the feeds are fed in dry form, eliminating much of the labor connected with pail feeding. While the calves may not be so fat and sleek as they are when more milk is fed, this method is effective in producing thrifty calves that are above normal in size with large body capacity.

Daily feeding schedules for a typical calf of the larger and of the smaller breeds are shown in figures 3 and 4.

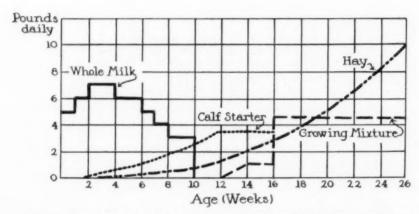


Figure 4. This feeding schedule, for the dry-calf-starter method of feeding Jersey and Guernsey calves is to be used only as a guide. Each calf must be fed carefully and according to its individual needs.

Whole milk

The total amount of whole milk allowed each calf should be approximately 350 pounds. Leave the calf with its mother for two or three days and then teach it to drink from a pail, or let it feed from a nipple pail.

A suggested daily milk-feeding schedule is the following:

TABLE 1. DAILY MILK-FEEDING SCHEDULE

Age	Ayrshires, Brown Swiss, and Holsteins	Guernseys and Jerseys
1 to 3 days	Pounds of milk With cow	Pounds of milk With cow
4 to 7 days	8	5
Second week		6
Third week	10	7
Fourth week	9	7
Fifth week		6
Sixth week		6
Seventh week	4	5
Eighth week		4
Ninth week		3
Tenth week		3

As shown, you may wean calves of the larger breeds at the end of seven weeks; those of the smaller breeds are weaned at the end of 10 weeks.

Dry calf starter

Feed the dry starter at the beginning of the second week. To give the calf a taste of the starter, rub a little into the calf's mouth, especially after each feeding of milk. Putting fresh starter in the feed box each day also helps to increase consumption. Be careful to feed each day approximately the amount the calf will clean up.

Calves differ greatly in their eating habits. Some readily eat large amounts of starter while others are slower to accept it.

Feed each calf all of the starter it will eat until a daily maximum of 4 pounds is reached for the larger breeds and 3.5 pounds for Guernseys and Jerseys. For a majority of calves, this amount is reached at from 12 to 14 weeks of age.

Many kinds of good calf starters are now on the market. Some of these are sold in the form of dry meal, some in pellets, and others are a mixture of meal and pellets. Some calves may prefer a starter in the meal form while others take more readily to pellets. Experiments show no particular advantage to either type of starter or to a mixture of meal and pellets. In using

TABLE 2. CALF STARTER FORMULAS

Ingredients	1	2	3
	Pounds	Pounds	Pounds
Cracked yellow corn	327.5	495.5	389.5
Crushed oats	400	400	400
Wheat bran	300	300	300
Lipseed oil meal	200	200	200
Dried skimmilk	200		100
Soybean oil meal	332	364	280
Cane molasses	100	100	100
Alfalfa leaf meal	100	100	140
Brewers' yeast			60
Irradiated yeast	0.5	0.5	0.5
Ground limestone	10	10	10
Dicalcium phosphate, or steamed bonemeal	20	20	10
Iodized salt	10	10	10
Total	2,000	2,000	2,000

any calf starter that is purchased, follow the directions of the manufacturer as closely as possible.

At Cornell University, several hundred calves have been used in many years of experiments on starters and on methods of feeding them, and many different formulas have been satisfactory. Of the starters fed to all breeds of

Figure 5. Calf should have access to starter in a box. Begin to feed starter the second week and give the calf all it will eat each day until a maximum of 4 pounds is reached.



calves, no one has proved to be consistently better than all others. So far, there has not been any one best formula for all conditions.

On the basis of these investigations, however, the three mixtures in table 2 are suggested as satisfactory in palatability and in developing good calves.

Under most conditions it is best to purchase a calf starter already mixed rather than to try to obtain the ingredients and mix them yourself.

Water

Calves should have free access to clean, fresh water at all times after they are about three weeks of age. This is especially important with the drystarter system because the amount of milk fed is relatively small, and young, growing animals have a high water requirement.

Grain mixture

When a calf reaches a maximum consumption of from 3.5 to 4.0 pounds of calf starter, or at about 12 to 14 weeks of age, the feed can be gradually changed over to a growing or fitting ration. The following mixture has been most commonly recommended, and is a good one:

280 pounds ground corn

300 pounds ground oats

300 pounds wheat bran

100 pounds soybean oil meal, or linseed oil meal

10 pounds salt

10 pounds steamed bonemeal, or dicalcium phosphate

Total 1,000 pounds

This mixture, to be fed following the starter feeding period, contains about 14 to 16 per cent total protein. If you use a 16 per cent protein mixture for your dairy herd, there is no reason why such a mixture is not satisfactory for calves. In fact, if non-legume hay is fed, a 16- or 18-per-cent-protein-grain mixture is likely to give better results than one lower in protein.

A calf should be on the growing mixture at about 16 weeks of age. Feed about 5 pounds daily to a calf of the larger breeds, and about 4 pounds daily for a Jersey or Guernsey.

It is desirable to keep flaked or granulated salt before the calves.

Hay

For best results from any calf-feeding program, and especially the drystarter method, it is essential to give calves free access to high-quality hay. Any variety of hay that was cut early and cured in such a way as to preserve the leaves and green color makes good calf hay. Contrary to common opinion in some sections, legume hay is entirely satisfactory. Second-cutting hay from a mixture of legumes and grasses that is soft and pliable is ideal. In addition to the carotene, vitamin D, and calcium furnished in good hay, heavy hay consumption develops the middles of calves and increases their capacity for roughage.

In all calf-starter experiments at Cornell University it has been a common observation that the growth rates and physical condition of the calves have varied directly with the quality of hay fed. When high-quality hay was used, far better results were obtained with the same starter formulas than was true in other seasons when it was necessary to use low-quality hay. The deficiencies in poor hay cannot be made up satisfactorily in the starter formula.

The progressive dairyman harvests a few tons of special calf hay for his

calves and stores it separately.

Feed hay as soon as the calf will eat it, usually about the second week. Allow a calf all of the hay it will eat. More will be eaten if fresh hay is put in the rack each day. To get the best results, feed the hay in racks rather than on the floor.

Amounts of feed required

The amount of feed eaten varies greatly between individual calves. With the dry-starter system, however, the following amounts of feeds are required to raise a calf up to six months of age:

Whole milk	 							350	po	ounds
Calf starter	 						0	200	to	300 pounds
Growing mixture	 							200	to	300 pounds
Hav	 							500	to	700 pounds

Growth rates to be expected

Holstein calves fed according to the dry-starter program should average 1.5 pounds of gain in weight a day up to six months of age. Brown Swiss should make approximately the same gains as Holsteins, while Ayrshires should gain about 1.3 pounds a day. Jersey and Guernsey calves fed in this way should gain from 1.0 to 1.25 pounds a day up to six months of age.

Whole-Milk Method

When price permits the feeding of milk longer than the first few weeks, the whole-milk method gives excellent results. Whole milk is the natural feed for calves and is one of the best single feeds. Many breeders of purebred dairy cattle prefer this method when they have valuable calves, especially those intended for show or sale purposes. Calves raised on liberal quantities of whole milk usually are fatter and smoother than calves raised on other methods. Care needs to be taken, however, not to feed too much milk as this may limit both the amount of hay eaten and proper development of the animal.

Follow the same milk feeding schedule for the first three weeks as that



Figure 6. For satisfactory growth, calves need to have access to early-cut, green, leafy hay in racks.

for the limited-whole-milk dry-calf-starter system. After this, you may increase the allowance of whole milk gradually to a maximum of from 12 to 14 pounds each day. With this method, continue milk feeding until the calf is at least four months of age and preferably until six months of age. The age to wean the calf from milk will depend upon its size and condition.

Usually, a calf will start to eat some grain by the end of the second week. The young calf will often eat whole oats or coarsely cracked corn or other grains more readily than it will a mixture of finely ground feeds. As the calf gets older, it will not chew feed so thoroughly as at a younger age; therefore, all concentrates should be ground. The same grain mixture as that given on page 11 for the dry-starter program is satisfactory to feed right from the beginning with the whole-milk method.

Enough of this mixture should be fed each day until the calf is eating 3 or 4 pounds. Too much grain mixture limits the amount of hay a calf will eat. Take care to keep the calf growing at all times but prevent an overfat condition.

High-quality hay is as essential with this method as it is with the drystarter system. Allow the calf at all times all of a leafy, fine-stemmed hay that it will eat.

Use of nurse cow

Some dairymen prefer to feed whole milk to their calves by the use of a nurse cow. Such a practice is used more often by breeders of purebred cattle than by the average dairyman. With this plan of feeding, there is less work than with pail feeding and there seems to be fewer calf troubles, especially

scours. Calves raised on this system are often fatter and sleeker in appearance than are pail-fed calves.

One nurse cow can handle several calves, depending upon her production. Enough calves should be placed on the cow so that each calf will get about 10 to 12 pounds of milk each day. The calves can be weaned at from 7 to 10 weeks of age and raised on a dry starter or they can be left on the cow for three to four months and fed grain and hay as with the pail feeding procedure of the whole-milk method. It is possible, therefore, for a cow to raise several groups of calves in one lactation.

Use of Skimmilk

When skimmilk is readily available on farms, the whole-milk and skim-'milk method of raising calves is satisfactory.

Leave the calf with its mother for two or three days and then feed whole milk during the first two weeks as described under the dry-starter method (page 9). At the third week gradually replace the whole milk with skimmilk. About a week is needed for the change, replacing each day 1 or 1.5 pounds of whole milk with an equal amount of skimmilk. After the third week, increase the amount of skimmilk up to 14 to 16 pounds each day, depending upon the growth and size of the calf. It may be desirable to continue feeding whole milk longer than three weeks if calves are weak or unthrifty.

With a limited amount of skimmilk, you may reduce the amount gradually when the calf is about 16 weeks of age until milk feeding is discontinued entirely. It is preferable, however, to continue skimmilk feeding until the calf is about six months old.

A suggested daily feeding schedule for a dairy calf according to the wholemilk and skimmilk method is the following:

TABLE 3. A Daily Feeding Schedule—Whole-Milk and Skimmilk Method

Age of calf		rown Swiss, lolstein	Guernsey and Jersey			
	Whole milk	Skimmilk	Whole milk	Skimmilk		
to 2 days	Pounds	Pounds	Pounds	Pounds		
1 to 3 days	With cow		With cow			
4 to 7 days	8		5	********		
Second week	9		6	********		
Third week	10 to 0	0 to 10	7 to 0	0 to 7		
Fourth week		10 to 12		8 to 9		
Fifth week		12 to 14		10 to 12		
Sixth to 16 weeks		14 to 16		12 to 14		

Feed skimmilk when it is fresh and at a uniform temperature of from 95° to 100°F. If purchased away from the farm, pasteurize the skimmilk before feeding it.

Allow the calf all of the high-quality hay it will eat. Provide a simple grain mixture as described on page 11 and feed in the same way as with the whole-milk method.

Dried skimmilk

When fresh skimmilk is not available, dried skimmilk (defatted dry milk solids) is a satisfactory feed for calves. Whether or not you use it will depend upon the cost of powdered skimmilk in comparison with the cost of milk substitutes and dry calf starters.

Powdered skimmilk is prepared for feeding by mixing 1 pound with 9 pounds of warm water. Mix it fresh at each feeding and feed it in the same manner and amounts as liquid skimmilk.

Use of Milk Substitutes

Several commercial calf meals that are rather concentrated and are sold as milk substitutes are on the market. These concentrated mixtures are usually fed in the form of a gruel and are designed to replace milk at a relatively young age of the calf, from 10 days to 2 weeks. In using any one of these products, follow the directions of the manufacturer.

In general, milk substitutes are not likely to produce calves that look so well as those raised on whole milk, skimmilk, or dry-starter methods. Calves raised on milk substitutes are often not so thrifty looking during the first few months as are calves raised by methods using more milk, but at later ages they generally compare favorably in growth and development.

Silage in Calf Rations

Whether or not silage should be fed to calves is often asked. Small amounts of good-quality corn silage or hay-crop silage may be fed after calves are from six to eight weeks of age; however, many dairymen prefer not to feed any silage until the calves are more than six months of age. If too much silage is fed, the amount of hay eaten may be reduced. Good-quality hay is a more valuable feed for young calves than is corn silage, because it is not so bulky and is higher in calcium and possibly other nutrients.

Pasture for Calves

Pasture grass is an excellent feed; however, calves under six months of age should not have to depend upon it. Calves of this age do better if they are turned out only for exercise, fresh air and sunshine. Calves often receive a setback during their first summer on pasture because they cannot



Figure 7. Calves need plenty of exercise and sunshine. They should not have to depend too much on pasture, however, until after one year of age.

get enough feed to produce satisfactory growth. Make any change to pasture gradually and continue to feed some grain and hay until calves are able to gather enough grass to meet their needs.

Early pasture grass is rich in protein and carotene, both of which are essential for the calf. In addition, when a calf is out on pasture it will get plenty of vitamin D from the sun.

Shade and water are always essential in the pasture lot. Be sure to furnish calves on pasture some shelter during the heat of the day. Also, make some provision for protection from flies.

Mineral Needs of Calves

Calves that get a good start on milk and then are fed on starter or grain and hay generally receive plenty of minerals, except common salt. Milk is rich in calcium and phosphorus. Legume hays are rich in calcium; therefore, calves fed plenty of hay, containing appreciable portions of legumes, are not likely to lack calcium.

The supply of phosphorus will be enough even after the calves are weaned, if you feed them from 2 to 3 pounds a day of a grain mixture containing one-fourth protein supplements, such as wheat bran, wheat middlings, soybean oil meal, or linseed meal. If the grain mixture is made up largely of cereal grains, add a phosphorus supplement, such as steamed bonemeal. Many of the soils are low in phosphorus and the hays grown thereon are low in this mineral element.

There have been a few cases of goiter in New York. Such a condition is caused by a lack of iodine. Where conditions have revealed an iodine deficiency, as shown by goiter in calves, the feeding of iodized salt to the cows will fully take care of the iodine needs and prevent goiter in calves.

Extensive areas of cobalt deficiencies have been observed in recent years in several States. Some recent observations have shown the possibility of cobalt deficiencies in dairy heifers in some of the northern counties of New York. Cobalt-deficient animals may have a rough hair coat, loss of appetite, and an unthrifty condition. These symptoms are also typical of other deficiencies but, if you are experiencing trouble, cobalt treatment can be tried. Dissolve 1 ounce of cobalt sulfate in a gallon of water and then feed 1 teaspoonful each day to a calf. The response of the animal will determine whether or not it is cobalt deficiency. Cobalt-deficient cattle respond very quickly, in a week or two, when fed cobalt salts.

To meet the needs of calves and heifers, keep common salt before them at all times. Where there is any danger of an iodine deficiency, use iodized salt. If you believe a mineral supplement in addition to salt is needed, the following is suggested:

100 pounds iodized salt

100 pounds steamed bonemeal, or dicalcium phosphate

If cobalt deficiency is indicated, you may use the following:

100 pounds iodized salt

100 pounds steamed bonemeal, or dicalcium phosphate
1 ounce cobalt sulfate (feeding grade)

Either one of these mixtures may be fed free choice or added at the rate of 2 per cent to the grain mixture.

Vitamins for Calves

OF THE many vitamins, only vitamin A and vitamin D have been shown to have any practical significance in feeding calves. Others are apparently needed by calves but are not likely to be lacking under practical feeding conditions.

Vitamin A

Vitamin A is essential for satisfactory growth, maintenance of good health, and it may be helpful in building up a resistance to diseases and bacterial infections.

The calf is born with little or no reserve supply of either vitamin A or vitamin D. Colostrum is the first source of these vitamins. The amount of these vitamins in the colostrum and normal milk depends largely upon the

ration of the cow. The amounts present in milk are usually adequate to meet the needs of calves, but under certain circumstances a vitamin-A supplement may be necessary. If for any reason the calf does not get colostrum, a supplement of vitamin A is essential. If taken off milk at too early an age, a supplement of vitamin A may be desirable until such time as the calf is eating 2 or 3 pounds of good, green, leafy hay each day. Use vitamin-A feeding oil or vitamin A concentrates. If you use the oils, add about 2 teaspoonfuls daily to the ration for about the first six weeks. Practically all of the dry starters, calf meals, and milk substitutes that are on the market contain sources of vitamin A.

Among the natural feeds for calves, hay that is green in color and is finestemmed and leafy is the best source of vitamin-A value. Pasture grass is high in carotene which furnishes plenty of vitamin A for those calves that are old enough to be turned on pasture. Also, silage from corn or hay crops is a good source of carotene.

Vitamin D

An ample supply of vitamin D is needed in the ration of calves because a lack of this vitamin may produce rickets. Sometimes calves that are making good growth may have mild cases of rickets as shown by a characteristic sag in the top line just back of the withers, a slight hump in the loin, and some stiffness in the joints. These symptoms, of course, are not specific for vitamin-D deficiency and are often due to other causes. Rickets are most likely to occur when calves are still on milk and not yet eating any significant amounts of hay. Experiments show that 2 pounds per head daily of sun-cured hay provides enough vitamin D to meet the calf's requirements. The calf, therefore, should be induced to eat high-quality hay as early as possible. Calves that eat large quantities of sun-cured hay seldom have rickets.

Calves and heifers will get plenty of vitamin D when they are out in the sun during the spring, summer, and fall months; therefore, any consideration of supplementary vitamin D would come only during the winter. If your calves have had rickets or if you are feeding poor-quality hay to young calves kept in the barn, it may be wise to add a vitamin D supplement to the ration. Two pounds of cod-liver oil for each ton of calf starter, or its equivalent in units of vitamin D in irradiated yeast, may be used to supply supplementary vitamin D.

Other Vitamins

Some reports indicate that extensive supplementation of the rations of dairy calves with multiple vitamin capsules or pills prevents nearly all cases of scours and other calf ailments. Large-scale practical and controlled experiments in New York, and two or three other States, have not shown any particular value from supplying young calves daily with pills containing

vitamins A and D, ascorbic acid (vitamin C), and niacin. Such vitamin supplementation will not take the place of good care, feeding, and management in raising calves.

Older calves and cows have the ability to synthesize in the rumen the important vitamins of the B-complex. Information is lacking for practical recommendations for adding any of these vitamins to the ration of calves at one or two weeks of age when the rumen may not be functioning. Milk and other feeds given early in life will furnish the B vitamins needed.

Housing and Management of Calves

PROPER housing and management are most important to raising healthy calves. Without good management no feeding schedule gives satisfactory results.

Quarters

Clean, well-lighted, properly ventilated quarters, free from drafts and dampness are essential in any good calf-raising program. You can meet these requirements without elaborate and expensive barns.

Individual pens with solid partitions between them are best for young calves. The solid partition prevents drafts from striking the calves, and common calf diseases can be controlled more easily because the calf has no contact with other calves. Such a system also prevents calves from sucking each other.

A satisfactory pen should be not less than 4 by 6 feet in size. A slatted gate allows good air circulation. Supply each pen with a hay rack, a feed box, and a water bowl or a place for a pail of water.

Keep the calves in the individual pens until they are from 8 to 12 weeks of age, or until they have been weaned from milk, if you follow the calf-starter method of feeding. After this, you can group them, according to size, in larger pens.

If you do not or cannot have individual pens, it is highly desirable to provide ties or stanchions along one side of the pen for calves at feeding time. Inexpensive stanchion arrangements are entirely satisfactory. With this method, you can keep more calves in a given amount of space and prevent them from sucking one another after their feeding of milk.

Supply adequate amounts of clean, dry bedding at all times. Usually it is better, however, not to remove the bedding each day. Add enough bedding to keep the pen dry, as the litter that accumulates generates heat and provides a warmer bed than if the pens were thoroughly cleaned each day. When you remove the calves, thoroughly clean and disinfect the pens before you put new calves into them.

In the colder climates, if health department regulations will permit, have the calf pens in the barn with the cows. In this way the cows furnish

VENTILATOR

8 LT. 8 x 10

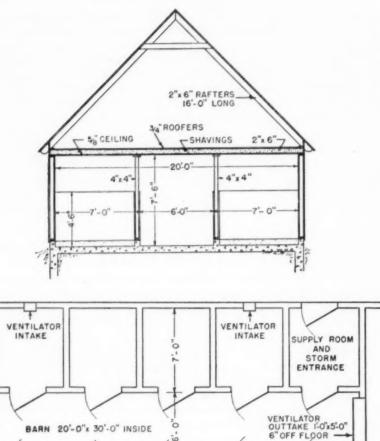


Figure 8. Construction details of the Cornell calf barn. Individual pens are desirable for young calves and help to reduce losses from colds and pneumonia.

VENTILATOR

0

enough heat to keep the calves warm. If you have special calf barns, provide artificial heat to keep the temperature above freezing and the barn free of dampness. If artificial heat is used, be sure that the temperature does not get above 50°F. It is important to remember, however, that a calf can withstand a considerable amount of cold weather if the quarters are kept dry. A simple blanket made of a feed sack provides good protection.

Exercise

Allow calves plenty of exercise and sunshine. If you use tie stalls, turn the calves out in exercise lots or pens regularly after they are a couple of months of age. Exercise lots should be well drained.

During the hot months of midsummer furnish some shade in the exercise lots. Often it is better to turn calves out for exercise early in the morning or late in the afternoon. They are usually better off in the barn during the heat of the day.

Marking for Identification

With purebred herds, it is necessary to identify properly and record all calves. This is essential for proper registration of animals. Certain breeds require that calves be tattooed in the ears before they can be registered.

Mark or number in some way all of the calves shortly after birth. Eartags are commonly used. Some dairymen put a strap or chain around the calf's neck with a numbered tag attached.

Dehorning

There is no good reason to leave horns on dairy cattle. Some breed fanciers think it improves the appearance of their cattle, but hornless cattle are not discriminated against in any of the major cattle shows or sales. If horns on all cows were removed, there would be fewer udder and body injuries.

The best time to remove horns is when the calves are about one or two weeks of age, or as soon as the horn buttons can be distinctly felt.

One method that has been most commonly used to prevent the growth of horns is the use of caustic potash. To apply this method, first clip the hair from around the base of the horn button with a pair of scissors. To prevent any excess caustic from running off the horn area and burning other parts, encircle the clipped area with vaseline or grease. The next and important step is to rub the horn button vigorously with the stick of caustic potash until the skin over the horn begins to bleed slightly. Be sure the end of the caustic held by the fingers is wrapped in paper or cloth to prevent burning your fingers. Several commercial dehorning pastes and pencils are on the market and should be used according to the manufacturers' directions.

This procedure if carried out properly when the calf is young leaves a good, smooth poll that is much better in appearance than if the horns are cut or sawed off after the animal reaches maturity.

Another satisfactory method that has been used some in recent years is to burn off the horns. Special branding irons are needed. They may be obtained from livestock-equipment companies. The irons are bell shaped to fit over the horn button. Heat the irons to a dull red and brand the skin around the base of the horn to a cherry red color. A set of three irons with opening the size of a dime, nickel, and quarter permits dehorning calves up to three months of age.

Removing Extra Teats

Sometimes heifer calves are born with extra teats. Later, these detract from the appearance of the udder and at times interfere with milking. They are easily removed at birth or before a year of age with a pair of sharp scissors. Disinfect the cut area with tincture of iodine or other antiseptic. If the extra teats cannot be readily distinguished or are attached to one of the regular teats, consult a veterinarian for the removal operation.

Care of the Feet

When calves and heifers are confined in pens or stanchions, the feet grow faster than they are worn off. Frequently the toes get long and turn up. This makes it impossible for the animal to stand or walk properly and may cause weak pasterns and crooked legs. Trim the toes back to normal shape with a wood chisel or hoof clippers. Use a wood rasp to level the bottom of the toes.

Teach Calves to Lead

Breeders of purebred cattle who show or consign cattle to sales want to train their calves to lead, stand, and pose. A well-trained animal is easier to handle when they have to be moved and show to better advantage in the show or sales ring. One of the best ways to do this is to tie the calf with a rope halter to a wall or post a few times until it learns that it is useless to try to escape. Then it may easily be taught to lead.

Prevention and Control of Calf Diseases

CALF losses during early life are very severe. While these losses vary, they sometimes run as high as 20 per cent. Many of these losses in calves result from digestive disturbances that precede pneumonia. Some diseases of calves are contagious and result in high mortality. Others may result in a severe setback in the calf's growth and development. With a true appreciation of these losses, it is generally possible to reduce them by better housing, management, sanitation, and improved feeding practices. Improved feeding

¹This section has been read and approved by Dr. M. G. Fincher of the New York State Veterinary College,

of the dam during the latter part of the gestation period may be beneficial in promoting good health in the early life of a calf.

If you watch your animals closely, you will detect any sickness promptly. Early detection helps to prevent the spread of an infectious disease and permits prompt treatment. To be successful in raising of calves, you need to have some knowledge of calf diseases and of practical measures for their control.

Every good dairyman or herdsman should have the advice of a competent veterinarian in adopting sanitation and disease-prevention programs. Regular veterinary service in this way helps materially to maintain a healthy calf herd and reduces the necessity to call in a veterinarian just for the treatment of sick calves.

Scours

Scours is one of the most common ailments of young calves. It includes all conditions in which there are frequent loose evacuations of the bowels. It is difficult to distinguish between white scours, apparently due to an infection, and common scours which may result from other causes.

White scours affects calves chiefly in the first one to three days. It is commonly termed infectious and is fatal in a large proportion of cases. There is a marked looseness of the bowels, with the feces being very thin, grayish white in color, and very foul smelling. Preventive measures are extremely important as little can be done once the calf is infected.

Common scours is an indication, or a result, of an upset digestive system. It may result from many causes. One of the most common is over-feeding of milk, especially during the first few weeks. Other causes may include irregularities in feeding milk, including time of feeding, amount fed, high fat content of milk and variations in temperature of milk; sudden changes in feeding, such as from whole milk to skimmilk or from sweet to sour milk; and dirty feed buckets and troughs. Cold, damp, and dirty quarters may help to lower the calf's resistance and thus make it more susceptible to digestive upsets.

With the first sign of scours, immediately try to find the cause and correct the condition. Usually it can be corrected by proper feeding and management. Isolate infected calves.

Many different common remedies have been used in treating scours. The most common in the past has been to reduce the milk by one-half or more and to correct any faults in regularity, in temperature of milk, and in sanitation. This is often followed with a physic of 1 or 2 ounces of castor oil in ½ pint of warm milk. A few hours later give the calf about ½ teacup of a mixture of 3 parts of mineral oil and 1 part of bismuth subnitrate mixed with a small quantity of milk. As soon as you notice some improvement in the condition of the calf, discontinue this mixture and gradually bring the calf back onto full feed.

Another home remedy frequently used is to give the calf some limewater. It may be fed in the milk at the rate of 1 part of limewater to 3 parts of milk. The limewater used should be the clear fluid obtained after the slacked lime has settled.

In recent years, the most effective treatment for scours has been to use certain of the sulfa drugs. The most common ones are sulfathalidine and sulfasuxidine. These and other sulfa drugs should be given to calves upon the advice and recommendations of a veterinarian. Along with good management practices, these drugs help to prevent scours in calves.

Considerable publicity has been given to the use of vitamin pills or capsules to prevent a majority of calf ailments, including scours. Supplementary vitamins will not take the place of good feeding and management practices. As pointed out earlier, calves need certain vitamins. If they are not supplied in the normal feeds, then supplementary vitamins, especially vitamin A, may be needed. Possibly heavy dosages of vitamin A would be effective in preventing scours in many herds. On the other hand, extensive and carefully controlled experiments have shown no particular value of regular feeding of vitamin capsules containing vitamins A and D, niacin, and ascorbic acid (vitamin C) in preventing common scours.

Pneumonia

Colds and pneumonia are frequent in dairy calves. They often follow common scours and cause great losses to dairy farmers each year. Pneumonia is more likely to develop in calves that are kept in damp, poorly ventilated and drafty quarters than in those well housed.

The symptoms are coughing and rapid breathing, followed by a high

temperature. There may be a lack of appetite.

Pneumonia may be of an infectious nature and spread to other calves. Therefore, isolate the affected calf, if possible, in a clean, dry, well-ventilated stall. Newborn calves should not be introduced into the general calf quarters if pneumonia is present in some of the calves.

The most effective treatment is to use one of the sulfa drugs. Sulfamerazine and sulfamethazine have been used quite successfully, especially in the early stages of pneumonia. Other drugs or medicines may be helpful and should be used as prescribed by a veterinarian.

Ringworm and Mange

Frequently, calves and heifers become affected with ringworm, mange, or barn itch during the late winter and early spring months.

Ringworm is caused by a fungus that attacks the skin and forms ringlike or circular areas that are scabby or crusty in appearance. These areas may appear on the neck, shoulders, or other parts of the body. To treat ringworm, the scaly areas should be washed with soap and water with a stiff brush. The infected areas then should be treated with tincture of iodine. The infected areas should be painted with tincture of iodine rather frequently until healing takes place.

Several types of infections produce the skin disease in cattle commonly called barn itch. The most important appears to be sarcoptic mange. It is quite infectious and is caused by a parasitic mite. If the infection is suspected, report it to a veterinarian for proper diagnosis. If diagnosed as sarcoptic mange, then it can be treated with 2 per cent hot (95° to 100°F.) lime-sulphur solution. This treatment should be repeated five or six times at 10-day intervals. Another treatment is to use benzene hexachloride. Two sprayings of infected animals, each from 7 to 10 days apart, are enough. Calves less than 3 months of age should not be treated with benzene hexachloride.

It is advisable to clean thoroughly all stalls and vehicles that may have come in contact with mangy animals. All contaminated surfaces should be scrubbed with a hot lye or soap solution, using a stiff brush.

Lice

Lice are a rather common problem on dairy farms, especially with heifers and bulls in the winter months. They cause discomfort to the animals, produce a rough, unthrifty appearance, and prevent proper growth of the animals. Skin injury may be induced because of constant rubbing.

Many commercial louse powders are on the market. The most effective ones contain either ½ per cent rotenone, 10 per cent sabadilla seed, or 10 per cent DDT.

Any powder that you use should be applied thoroughly to all parts of the animal. It takes about three ounces for each animal. Be sure to cover the legs, the inside of the ears, the wrinkles along the neck, and the areas around the head. Treat all animals in the herd, not just a few obviously lousy ones. Repeat any treatment in 10 to 15 days to kill the lice which hatch out following the initial treatment. A thorough dusting of all the animals in the fall a few weeks after they are stabled usually lasts through the winter.

Hand application of dust is effective and is satisfactory for a small number of animals. For large herds, however, a small bellows type puff duster is much more useful.

Preliminary experiments indicate that one treatment of benzene hexachloride is effective in killing lice on calves and heifers more than 3 months of age. Consult your county agent for specific information.

Cattle Grubs

Heifers and cows often are affected by the ox warble, or cattle grub. These cattle grubs are the immature stages of two species of black and yellow, hairy flies about ½ inch in length. These flies attack cattle in the spring and

early summer and cause the cattle to run around the pastures and seek shelter of brush, trees, or barns, The flies attach their eggs to the hair of the legs and lower parts of the cattle. After the eggs hatch, the small larvae crawl to the base of the hair and burrow through the skin. Eventually they work their way to the back of the animal and cause the familiar bumps under the skin that are commonly seen during late winter.

It is relatively easy to control grubs by the use of a rotenone powder. Prepared dusts that contain 1 part of 4 to 5 per cent rotenone powder with 3 parts of pyrophyllite are on the market. The dust is easily applied to the backs of animals with a shaker can. Apply the dust liberally, and thoroughly rub it into the hair. About 1 pound of dust is needed for each 7 or 8 animals. Make the treatment when the grubs begin to emerge, usually about a month before the start of the pasture season. A second treatment one month later sometimes is needed to kill late grubs. Complete treatment of all herds in area is the most effective procedure for the control of grubs.

Internal Parasites

Calves and heifers are subject to infestation with intestinal parasites. Animals with a heavy infestation of parasites may show a general unthrifty condition, a rough hair coat, poor appetite, loss of weight, and usually a bloody diarrhea. Pneumonia often develops. Spread of these parasites from one animal to another is by the ingestion of eggs or young parasites that contaminate the feed and bedding.

Some of the newer sulfa drugs may be helpful in treating certain types of intestinal parasites (coccidiosis), but careful management and sanitation go a long way toward prevention.

Large numbers of calves confined in small lots are often heavily infected. Young calves often become infected in pasture or exercise lots. Segregation of calves and heifers into groups by ages is helpful. Also, keeping calves under six months of age off pasture is a good practice.

Calf Vaccination for Brucellosis

Brucellosis, or Bang's disease, in cattle is a costly disease. Dead and weak calves at birth, many abortions, breeding troubles, and lower milk production are the result. Fortunately, brucellosis can now be controlled and these losses reduced. A program of calf vaccination and blood testing operates in most States. In New York State, both calf vaccination and blood testing are provided free to all herd owners officially enrolled with the Bureau of Animal Industry.

Under most herd conditions, dairymen are encouraged to have their calves vaccinated between the ages of six and twelve months. While this vaccination immunity is not complete and everlasting protection, farmers' experiences and experimental results prove it highly preventive and practical. Usually all dairy calves should be vaccinated against this disease. For further information about the brucellosis control program, consult a local veterinarian or a county agricultural agent.

Proper Development of Dairy Heifers Relation of Size of Cow to Production

The productive ability of a dairy cow is closely related to her capacity to eat feed over and above her maintenance requirements. The nutrients required for maintenance are higher for a larger cow but do not increase in

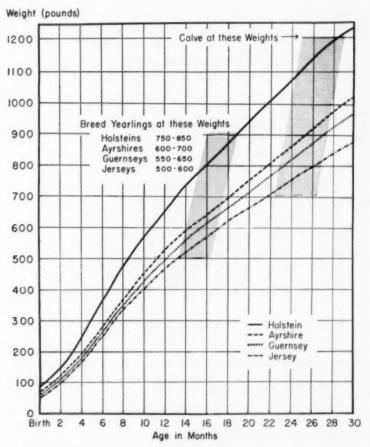


Figure 9. Heifers that are well-grown can be bred at the size and age shown.

direct proportion to body size. A cow's capacity for roughage is in direct proportion to her body size. Thus the larger cow can eat more roughage and will have a larger proportion of the nutrients from roughage left over above maintenance for milk production. The advantage of size in the dairy cow is greatest when the full capacity of the cow for forage is utilized.

A study of 2833 Dairy Herd Improvement Association records show that milk production is almost directly proportional to body size. Each 100-pound increase in body size of Holstein cows gave an average increase of 779 pounds of milk each year. Other studies have shown that most of the increase in production that a mature cow makes over her two-year-old record is due to her increase in body size. Thus, the more growth and body development obtained on dairy heifers, the more milk they will produce. The ultimate size of a dairy cow is determined by heredity and by the opportunity given for growth through adequate feeding and management.

Growth Standards for Dairy Heifers

Desirable or optimum growth rates for heifers of the major dairy breeds are shown in figure 9. The growth rate is one of the best indications of how well calves and heifers are being fed. Check occasionally on the heart girth and estimated weights of calves and heifers being raised. If they are not growing as fast as the standards in figure 9, you may need to make some adjustments in the calf and heifer feeding program.

Estimating the Weights of Dairy Heifers

Weights of dairy heifers can be estimated accurately from their heart-girth measurements if scales are not available. Place a tape measure around the heart girth, just behind the shoulders and elbows. Be sure that the animal is standing squarely on all four legs and her head in a normal position. Draw the tape snugly and read the heart girth in inches. Check this measurement with table 4 to obtain the estimated weight. Weight tapes that give the estimated weights directly are available from some feed companies.

When to Breed

The age and size at which heifers should be bred are shown also in figure 9. For example, Holstein heifers may be bred anytime after they weigh 750 pounds. Likewise, Ayrshires may be bred when they weigh 600 pounds, Guernseys at 550 pounds, and Jerseys at 500 pounds. Normal growth figures are not available for Brown Swiss but their growth rates and size are similar to those for Holsteins.

Fall-freshening cows produce more milk and give greater financial returns than do spring-freshening cows. To maintain a fall and winter dairy

TABLE 4. Estimating Weights of Dairy Cattle from Heart-Girth Measurements*

Heart girth	Weight						
Inches	Pounds	Inches	Pounds	Inches	Pounds	Inches	Pounds
26	80	43	257	60	637	77	1,285
27	84	44	275	61	668	78	1,331
28	89	45	294	62	700	79	1,377
29	95	46	314	63	732	80	1,423
30	101	47	334	64	766	81	1,469
31	108	48	354	65	800	82	1,515
32	118	49	374	66	835	83	1,561
33	128	50	394	67	871	84	1,607
34	138	51	414	68	908	85	1,653
35	148	52	434	69	947	86	1,699
36	158	53	456	70	987	87	1,745
37	168	54	478	71	1,027	88	1,791
38	180	55	501	72	1,069	89	1,837
39	192	56	526	73	1,111	90	1,883
40	208	57	552	74	1,153	91	1,929
41	224	58	579	75	1,197	92	1,975
42	240	59	607	76	1,241		

^{*}Data furnished by the Bureau of Dairy Industry of the United States Department of Agriculture.

herd, breed as many heifers as possible in November, December, January, and February to freshen in August, September, October, and November. Fall-freshening cows tend to change over eventually to spring freshening. It is easier to breed heifers for fall freshening than it is to change the freshening cycle of older cows.

Feeding Schedule for Dairy Heifers

Winter Feeding

If heifers are to reach ideal size and capacity as two-year-olds, they must be kept growing rapidly and continuously every day from birth to time of freshening. An average daily gain from birth of 1.4 pounds for Holsteins, 1.4 pounds for Brown Swiss, 1.2 pounds for Ayrshires, 1.1 pounds for Guernseys and 1.0 pounds for Jerseys is needed to meet the growth standards at 2 years of age shown in figure 9. To obtain this growth liberal feeding and careful management at all times are required.



Figure 10. The weight of a calf can be estimated by measuring the heart girth. Weighing calves at regular intervals helps to check growth rates.

Hay

Free access to good-quality mixed or legume hay in racks or mangers is the most important part of a winter feeding program for dairy heifers. Good-quality hay is a low-cost source of total digestible nutrients and furnishes most of the protein, minerals, and vitamins needed for rapid growth. Heifers eat about $2\frac{1}{2}$ pounds of good hay, or its equivalent in silage and other roughage, each day for each 100 pounds of liveweight.

Silage

You may feed yearling heifers liberal amounts of corn or hay-crop silage during the winter months. The amounts to feed will be determined somewhat by the supply of silage in relation to hay and other available roughages. From 2 to 3 pounds of silage each day for each 100 pounds of liveweight is usually enough. For a majority of heifers, this amounts to from 15 to 20 pounds each day.

Concentrates

Some concentrates are usually needed in addition to hay and silage to balance properly the ration and to supply enough nutrients for rapid growth. The protein needed in the concentrate mixture depends on the kind, amount, and quality of roughage eaten. Feed a concentrate mixture containing from 12 to 14 per cent total protein with legume hay, 16 per cent with mixed hay, and 18 to 20 per cent with grass hay. In general, the same concentrate mixture used for the milking cows will be satisfactory for calves and heifers after they are 4 months of age. Suggested amounts of grain to feed each day according to the size of heifers and the quality of roughage are given in table 5.

Feeding Heifers on Pasture

Good pasture is the lowest cost source of nutrients for growing heifers. Heifers may be started gradually on pasture at 5 or 6 months of age, but

TABLE 5. Pounds of Concentrates to Feed Dairy Heifers

Liveweight of heifers	Quality of roughage*							
	Good	Fair	Poor					
300 pounds	5	6	7					
400 pounds	4	6	8					
500 pounds	3	6	9					
600 pounds to 2 months before freshening	2	6	9					
Last 2 months before freshening	6	8	10					

*Good. Liberal feeding of good-quality, leafy, green hay that was cut early, with or without silage.

Fair. Usual or average quality hay showing some loss of color and leaves due to late cutting or weather damage; limited amount of silage.

Poor. Late cut mature hay or hay badly weather damaged; little or no good quality silage.

†Heavy rates of grain feeding will not entirely make up the deficiencies of poor quality roughage.

they should not be expected to depend entirely on pasture until they are close to a year of age. A pasture near the barn where young heifers can be fed hay in racks and some supplementary grain make an ideal arrangement for heifers under one year of age.

Yearling heifers will make satisfactory growth on excellent pasture without additional concentrates. But to have high-quality heifer pastures throughout the summer, improved seeded pastures of tall-growing legumes and grasses are needed. Ladino clover and orchard grass; alfalfa, bromegrass, and Ladino; or birdsfoot trefoil and timothy make good pasture combinations.

Figure 11. When young heifers are first turned on pasture, some supplementary feed is desirable to maintain continuous growth. A common mistake is to turn calves out at too early an age on too poor pasture. Note the feed box and hay rack.





Figure 12. Heifers need good pastures for satisfactory growth. Yearling heifers will make normal and more economical growth on improved pastures. High-quality pasture is just as important for heifers as for cows.

Figure 13. Dairy heifers require liberal feeding. Hay and silage should be fed to heifers during the summer months if the pasture is only fair or poor. Some grain also may be needed.



Legume aftermath and sudan grass can be used to supplement permanent pastures in July and August. Heifers need fully as good pastures to make rapid growth as do milking cows to produce well.

It is poor economy to put older heifers out on poor pastures. When good pasture is not available, give heifers free access to hay, corn silage, or hay-crop silage in racks or in bunks in the barnyard or in the pasture. You will need to feed some grain, in addition to supplementary roughage, if pastures are poor.

Water

Heifers need plenty of clean fresh water at all times. Water in the pastures is especially important. If running streams or springs are not available, provide other sources of water. Heifers graze better if water is available at all times in the pasture than if they have to walk a long distance for it or are watered only once or twice daily.

Minerals

Heifers on pasture need free access to salt, and a mineral mixture often is advisable because they usually are fed little or no grain. An easily constructed pasture mineral box is shown in figure 14. Salt can be put in one side and the other side may be used for one of the mineral mixtures on page 17.





Housing Plans for Dairy Heifers Pen Stabling

The pen or loose-stabling method of housing heifers is the most efficient from the labor standpoint and has the further advantage that roughage can be self-fed in racks. In fact, the essential shelter requirements, namely, protection from wind, rain, and snow, can be met with a low-cost shed-type structure. From 40 to 50 square feet of floor space per head will be needed. The ceiling needs to be 8 or 9 feet high so that 2 or 3 feet of bedding can be accumulated and built up during the winter months. It is best to divide the stable into several pens so that heifers of a similar size and age can run together.

Two feet of rack and grain-feeding space are needed per head. A combination feed alley and manger between every two pens (figure 15) makes a satisfactory feeding arrangement. If hay storage is over head, the hay chutes should be directly over the manger or hay rack.

Stanchions

Heifers may also be tied or stanchioned in stalls with the usual platform and gutter arrangement. In this case the stalls need to vary from 3 to 4 feet in width and from 4 to 5½ feet in length to accommodate heifers of different sizes.

Exercise Yard

A well-drained exercise yard is needed with either method of stabling. Heifers that are allowed several hours of daily outdoor exercise have better appetites, develop straighter and stronger legs, and keep their feet worn down to normal shape, and it is easier to detect when they are in heat. Sunlight is an additional source of vitamin D.

Preparation for Freshening

Two months before each heifer is due to freshen with her first calf, stanchion her with the milking herd so that she becomes accustomed to the other cows in the herd and to her stall in the barn. Handled in this manner, she will be easier to train into good milking habits.

At the same time the heifer needs to be conditioned properly for freshening. Usually from 6 to 10 pounds of fitting ration in addition to high-quality hay or pasture are needed to get heifers in the desired physical condition.

Heifers are likely to develop more congestion in the udder at freshening time than are older cows. In severe cases of udder congestion it may be desirable to start milking heifers a week or two before they freshen. Once milking is started, it must be continued and the udder completely milked out at each milking.

Training to Milk

The life-long milking habits of a cow are usually determined by the way she is trained to milk at her first freshening. Be kind and gentle in handling the heifer at milking time. If machine milking is to be used, start the heifer out on the machine and train her for rapid milking. Massage the

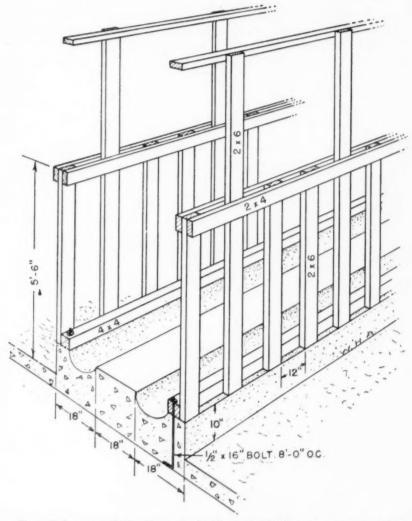


Figure 15. A manger of this sort is convenient for feeding heifers during the winter when they are in a loose stable.

udder with a cloth wrung out of hot water (130°F.) to stimulate milk let down. Apply the teat cups in about one-half minute. Remove the machine in 3 or 4 minutes or as soon as the udder is milked out. Strip by machine and never prolong hand stripping.

Feeding and Raising the Young Dairy Bull

The same methods of feeding, care, and management outlined for dairy heifers apply to dairy bulls under six months of age. Bulls begin to show evidence of masculinity and sexual maturity at about six months of age and should then be separated from open heifers to prevent unwanted matings.

From this age on bulls tend to grow more rapidly than heifers and need slightly more feed, especially concentrates. Most dairymen like to see their future herd sires well grown and properly developed, so liberal feeding of growing bulls is desirable.

As bulls approach maturity, feed 1 pound of good-quality hay or its equivalent and about one-half pound of concentrates each day per 100 pounds of live weight to maintain good breeding condition.

When the bull is about a year of age, insert a light bull ring in his nose and teach him to lead with a staff. When the bull gets older, replace the light ring with a larger heavier one.

Bulls may be used for light service when they are about a year of age. Limit the yearling bull to from 12 to 15 services the first year to prevent the danger of lower fertility later on.

The use of a safety stall and breeding rack for older bulls is highly desirable and often necessary. Therefore, it is a good idea to train the young bull to use a breeding rack and to house him in a safety bull pen. There is no such thing as a gentle or safe bull.

A publication of the New York State College of Agriculture, a unit of the State University of New York, at Cornell University



Published by the New York State College of Agriculture at Cornell University, Ithaca, New York. M. C. Bond, Director of Extension. This bulletin is published and distributed in furtherance of the purposes provided for in the Acts of Congress of May 8 and June 30, 1914.